REMARKS

Claims 1-30 were pending in the application at the time the present Office Action was mailed. Claims 1, 13, 16 and 24 have been amended by the present response. More specifically, independent claims 1, 16 and 24 have been amended to clarify certain aspects of these claims, and dependent claim 13 has been rewritten in independent form to include all the features of corresponding base claim 1 and any intervening claims. The amendment to claim 13 does not necessitate a new search of the prior art. Accordingly, any subsequent rejection of claim 13 based on new grounds cannot be made final. No claims have been added or cancelled by the present response. Accordingly, claims 1-30 remain pending in the present application.

In the present Office Action, the title of the invention was objected to, and claims 1-30 were rejected. More specifically, the status of the application in view of the Office Action is as follows:

(A) The title of the application was objected to as being non-descriptive;

(B) Claims 1-3, 5, 6, 9, 10, 13-18, 21, 23-26, 29 and 30 were rejected under 35 U.S.C. § 103(e) as being anticipated by U.S. Patent No. 6,703,310 to Mashino et al. ("Mashino");

(C) Claims 4, 7, 8, 19 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of U.S. Patent No. 3,345,134 to Heymer et al. ("Heymer"); and

(D) Claims 11, 12, 22, 27 and 28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of U.S. Patent No. 6,667,551 to Hanaoka et al. ("Hanaoka").

The undersigned attorney wishes to thank the Examiner for engaging in a telephone conference on October 17, 2005, to discuss the present Office Action. During the course of the telephone conference, the undersigned attorney and the Examiner discussed a number of distinctions between the pending claims and the applied references. For example, the Examiner acknowledged that the Mashino

reference failed to teach or suggest at least the features of claim 13. The following remarks summarize and expand on the points raised during the telephone conference, and reflect the agreements reached between the parties.

A. Response to the Objection to the Title of the Application

The Office Action objects to the title of the application as being non-descriptive. In the interest of expediting prosecution, and without conceding the merits of this objection, applicants have elected to amend the title to read "METHODS FOR FORMING VIAS IN MICROELECTRONIC DEVICES, AND METHODS FOR PACKAGING MICROELECTRONIC DEVICES." The amended title is clearly descriptive of the claimed invention. Accordingly, the objection to the title should be withdrawn.

B. Response to the Section 102 Rejection of Claims 1-3, 5, 6, 9, 10, 13-18, 21, 23-26, 29 and 30

Claims 1-3, 5, 6, 9, 10, 13-18, 21, 23-26, 29 and 30 were rejected under 35 U.S.C. § 102(e) as being anticipated by Mashino.

1. Mashino Is Directed to a Semiconductor Device in Which Insulating Material Covers the Side Walls of a Through-Hole Passing Through a Bond-Pad and the Underlying Semiconductor Substrate

Under the heading "Summary of the Invention," Mashino states "An object of the present invention is to provide a semiconductor device having a through hole passing through an electrode pad and a semiconductor substrate, in which sufficient insulation between the electrode pad and the semiconductor substrate at the sidewalls of the through hole is secured." (See Col. 2 of Mashino at lines 56-61; emphasis added). The insulation on the side walls of the through hole is clearly depicted in Figure 1B of Mashino. As this view shows, a semiconductor device 215 includes a through hole 212 extending through a bond-pad 203 and a silicon substrate 201. Insulating film 209 (e.g., SiO_2 film) is applied to the side walls of the through hole 212, thereby preventing any conductive material which is subsequently deposited in the through hole 212 from contacting the bond-pad 203.

Mashino discusses formation of the through hole 212 in column 9 at lines 37-59. In particular, at lines 54-59, Mashino emphasizes that the advantage of his structure is that the insulating layer 209 can be "sufficiently secured" on the side walls of the through hole 212 between the bond-pad 203 and the silicon substrate 201. Mashino points to this feature of his invention as being a particular advantage over the prior art. Specifically, in reference to the prior art illustrated in Figures 9A-11, Mashino states "the height D2 is relatively small, so it is difficult to secure sufficient insulation between the silicon substrate 102 and the main electrode pad 105 at the side walls of the through hole 111."

2. Independent Claims 1, 16 and 24 Are Directed to Methods of Manufacturing Microelectronic Devices in Which Electrically Conductive Material Extends Through a Passage in a Bond-Pad and Contacts the Bond-Pad

Independent claims 1, 16 and 24 are directed to manufacturing methods in which electrically conductive material is deposited in a passage that extends through a bond-pad and a die. In these claims, the electrically conductive material deposited in the passage contacts the bond-pad. Independent claim 1, for example, is directed to a method of manufacturing a microelectronic device having a die with an integrated circuit. The method includes, *inter alia*, forming a bond-pad and a redistribution layer on the die. The redistribution layer includes a conductive line having a first end portion attached to the bond-pad and a second end portion spaced apart from the bond-pad. The method further includes forming a passage through the die, the bond-pad, and the first end portion of the conductive line; and depositing an electrically conductive material into at least a portion of the passage. As amended, Claim 1 recites that the electrically conductive material extends through the bond-pad and contacts the bond-pad. Independent claims 16 and 24 include features similar to claim 1.

3. Mashino Cannot Support a Section 102 Rejection of Independent Claims 1, 16 and 24 for at Least the Reason That This Reference Fails to Teach or Suggest Depositing Electrically Conductive Material Into a Passage That Extends Through a Bond-Pad and a Die So That the Electrically Conductive Material Contacts the Bond-Pad

In each of the independent claims 1, 16 and 24, electrically conductive material is deposited into a passage that extends through a die, a bond-pad, and a first end portion of a conductive line. As amended, these claims further recite that the electrically conductive material contacts the bond-pad. In contrast to the claimed invention, Mashino explicitly teaches insulating the side walls of such a passage to prevent the electrically conductive material from contacting the bond-pad. Indeed, according to Mashino, one of the main problems with prior art semiconductor devices is that they lack "sufficient insulation between the silicon substrate 102 and the main electrode pad 105 at the side walls of the through hole 111." (See, e.g., column 2 of Mashino at lines 29-33).

The side wall insulation taught by Mashino is clearly shown in, for example, Figure 1B of Mashino. As this view clearly illustrates, the insulating film 209 extends along the entire side walls of the through hole 212, thereby insulating the bond-pad 203 from the conductive inter-connection pattern 214 that is subsequently applied to the side walls of the through hole 212. In contrast to Figure 1B of Mashino, Figure 5C of the present application clearly illustrates a microelectronic device 510 in which a metal fill 576 extends through a passage 574 and directly contacts the inner sidewalls of the bond-pad 216. Therefore, Mashino cannot support a Section 102 rejection of independent claims 1, 16 and 24 for at least the reason that this reference fails to teach or suggest a microelectronic device in which electrically conductive material deposited in a passage through a die, a bond-pad, and a first end portion of a conductive line contacts the bond-pad. Therefore the rejection of independent claims 1, 16 and 24 should be withdrawn.

Claims 2, 3, 5, 6, 9, 10, 14 and 15 depend from base claim 1. Claims 17, 18, 21 and 23 depend from base claim 16. Claims 25, 26, 29 and 30 depend from base claim 24. Accordingly, Mashino cannot support a Section 102 rejection of dependent claims

2, 3, 5, 6, 9, 10, 14, 15, 17, 18, 21, 23, 25, 26, 29 and 30 for at least the reason that this reference cannot support a Section 102 rejection of corresponding base claims 1, 16 and 24, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 2, 3, 5, 6, 9, 10, 14, 15, 17, 18, 21, 23, 25, 26, 29 and 30 should be withdrawn.

4. Mashino Cannot Support a Section 102 Rejection of Independent Claim 13 for at Least the Reason That This Reference Fails to Teach or Suggest Forming a Ball-Pad on a Second End Portion of a Conductive Line and Depositing a Solder Ball on the Ball-Pad

Claim 13 has been rewritten in independent form to include all the features of corresponding base claim 1 and any intervening claims. This amendment does not necessitate a new search of the prior art. Accordingly, any subsequent rejection of claim 13 based on new grounds cannot be made final.

Claim 13 is directed to a method of manufacturing a microelectronic device having a die with an integrated circuit. The method includes, *inter alia*, forming a bond-pad and a redistribution layer on the die. The redistribution layer includes a conductive line having a first end portion attached to the bond-pad and a second end portion spaced apart from the bond-pad. The method further includes forming a passage through the die, the bond-pad, and the first end portion of the conductive line; and depositing an electrically conductive material into at least a portion of the passage. The method additionally includes forming a ball-pad on the second end portion of the conductive line, and depositing a solder ball on the ball-pad.

The Office Action identifies the "second end portion 211X of redistribution layer 205" of Mashino as representing the second end portion of the conductive line of claim 13. During the telephone conference of October 17, 2005, the Examiner acknowledged that Mashino fails to teach or suggest forming a ball-pad on the second end portion 211X of the redistribution layer 205 or, for that matter, depositing a solder ball on such a ball-pad. (Indeed, the only solder balls discussed by Mashino are attached to the opposite side of the semiconductor device (see, e.g., solder bumps 210 in Figures 1A or 8 of Mashino). Accordingly, Mashino cannot support a Section 102 rejection of

independent claim 13 for at least the reason that this reference fails to teach or suggest forming a ball-pad on a second end portion of a conductive line, *or* depositing a solder ball on the ball-pad. Therefore, the rejection of claim 13 should be withdrawn.

C. Response to the Section 103 Rejection of Claims 4, 7, 8, 19 and 20

Claims 4, 7, 8, 19 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of Heymer.

Claims 4, 7 and 8 depend from base claim 1, and claims 19 and 20 depend from base claim 16. As set forth above in regard to the Section 102 rejection of base claims 1 and 16, Mashino fails to teach or suggest a microelectronic device having a through hole in which electrically conductive material contacts a bond-pad. Further, Heymer fails to cure this deficiency of Mashino. In fact, the Office Action only relies on Heymer to teach the particular features of dependent claims 4, 7, 8, 19 and 20 which are missing from Mashino. Accordingly, Mashino and Heymer cannot support a Section 103 rejection of dependent claims 4, 7, 8, 19 and 20 for at least the reason that these references, either alone or in combination, cannot support a Section 103 rejection of corresponding base claims 1 and 16, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 4, 7, 8, 19 and 20 should be withdrawn.

D. Response to the Section 103 Rejection of Claims 11, 12, 22, 27 and 28

Claims 11, 12, 22, 27 and 28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mashino in view of Hanaoka.

Claims 11 and 12 depend from base claim 1, and claims 27 and 28 depend from base claim 24. As set forth above in regard to the Section 102 rejection of base claims 1 and 24, Mashino fails to teach or suggest all the features of these base claims. Furthermore, Hanaoka fails to cure the deficiencies of Mashino. In fact, the Office Action only relies on Hanaoka to teach the features of dependent claims 11, 12, 22, 27 and 28 which are missing from Mashino. Therefore, Mashino and Hanaoka cannot support a Section 103 rejection of dependent claims 11, 12, 22, 27 and 28 for at least

the reason that these references, either alone or in combination, cannot support a Section 103 rejection of corresponding base claims 1 and 24, and for the additional features of these dependent claims. Therefore, the rejection of dependent claims 11, 12, 22, 27 and 28 should be withdrawn.

E. Conclusion

In view of the foregoing, the claims pending in the application comply with 35 U.S.C. § 112 and patentably define over the applied art. Therefore, a Notice of Allowance is respectfully requested. If the Examiner has any questions or believes another telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-6351.

Respectfully submitted,

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